PLANNING A NEW NATIONAL MACRO-MOTH RECORDING SCHEME

RICHARD FOX[1], ADRIAN SPALDING[2], MARK TUNMORE[3] and MARK PARSONS[1]

[1]*Butterfly Conservation, Manor Yard, East Lulworth, Dorset BH20 5QP.*
[2]*Spalding Associates (Environmental) Ltd., Norfolk House, 16–17 Lemon Street, Truro, Cornwall TR1 2LS.*
[3]*Trewhella Cottage, Cury Cross Lanes, Helston, Cornwall TR12 7AZ*
Corresponding author: Richard Fox rfox@butterfly-conservation.org

INTRODUCTION

Thanks to the expertise and dedication of amateur naturalists, the level of knowledge of the distribution, population levels and conservation status of Britain's fauna and flora is unique. No other country benefits from such an in-depth understanding of its natural heritage. For the best-worked groups, objective measures of change over time can be calculated from repeated, comprehensive distribution surveys and population monitoring. This knowledge is the essential foundation for almost all aspects of nature conservation at a time of widespread declines in biodiversity. Furthermore, the data generated by recording can be used for many other purposes, such as assessing the impacts of climate change, identifying shifts in phenology and voltinism, and raising awareness and appreciation of wildlife amongst the general public.

Vascular plants, birds and butterflies are sufficiently well worked to provide trend and status information. Indeed, repeated national surveys of these three groups have afforded the first opportunity to compare country-scale trends in an invertebrate group (i.e. butterflies) with those of vascular plants and birds (Thomas *et al.*, 2004). In addition to these three main groups, there is good knowledge of population or distribution trends in mammals and certain (often rare) species in other taxa. However, for the vast majority of British species knowledge of distribution and changing status is lacking. Insects make up the largest portion of UK biodiversity (Department of the Environment, 1994) and so to adequately assess changes to our biodiversity, it is vital that information is available for at least one, species-rich and ecologically diverse insect group. We believe that the Lepidoptera are particularly well suited for this purpose. This paper reports on the findings of a year-long planning and consultation project carried out by a partnership of organisations led by Butterfly Conservation and designed to pave the way towards a national recording scheme for macro-moths.

WHY MACRO-MOTHS?

Some 2500 species of Lepidoptera have been recorded in Britain so far (the precise number varying according to source), so the group clearly meets the criteria of being species-rich. Lepidoptera are also ecologically diverse and might be expected to be good indicators of change in most terrestrial biotopes. At the ecosystem level, moths are significant herbivores and pollinators, as well as hosts for numerous hymenopteran and dipteran parasitoids and important prey items for many predators, including birds (see review by Glen, 2004) and bats (see review by Vaughan, 1997).

Questions of the suitability of most insect groups pale almost into insignificance when compared with those of feasibility. To generate information on trends in abundance or distribution, comprehensive recording and monitoring is needed and there are simply too few recorders to achieve this is for all of the species-rich insect taxa at present, with the exception of the Lepidoptera.

There are already comprehensive distribution surveys of butterflies, organised by the national recording scheme, Butterflies for the New Millennium (Asher *et al.*, 2001), and population monitoring transects at over 500 sites (Brereton & Stewart, 2003). There are also four active national recording schemes for groups of micro-moths (covering the Incurvaroidea, Pyralidae and Pterophoridae, Gelechiidae and six small families, and the leaf miners). Together these four schemes represent over half of the 1600 micro-moth species in Britain (N. Greatorex-Davies pers. comm.). However, the 800 or so species of macro-moths, which make up the remainder of the Lepidoptera, are not covered by a national recording scheme at present, although the National Scarce Moth Recording Scheme has operated since 1991, collating records of Red Data Book and Nationally Scarce macro-moths across the UK. This scheme is co-ordinated by Butterfly Conservation with financial support from the Joint Nature Conservation Committee. Despite the absence of a national recording scheme covering all macro-moths, there is clear potential to produce comprehensive trend information about this significant group of insects for the following reasons:

- Macro-moths are popular with amateur entomologists and natural history recorders
- Moths and moth recording appear to be growing rapidly in popularity
- Much recording effort is already taking place at site and county levels
- There is an existing network of county moth recorders, each collating records for their area and many maintaining computer databases
- Many local moth groups have been set up to encourage recording, study and enjoyment of moths
- A growing number of popular journals, magazines, newsletters, web sites and internet discussion sites cover macro-moths
- Good identification guides exist for the group
- Many organisations run training events for macro-moth recording and identification
- Moth traps and other useful equipment are readily available
- Many counties have a published macro-moth list or distribution atlas
- There is a long history of macro-moth recording in Britain and much historical distribution data could be collated from various sources (e.g. computerised records, publications, collections etc.)
- Considerable knowledge exists as to the taxonomic status and ecology of macro-moths, and there is much active research
- Many moth recorders are now computerising their sightings due to good, affordable recording software.

With the addition of data on macro-moths from a new national recording scheme, there would be potential to examine status and trends from some 1700 of the 2500 Lepidoptera species in Britain. This would really start to redress the bias towards vascular plants and vertebrates that exists in nature conservation policy and practice, and improve the public perception of moths!

There is yet another good reason to attempt to set up a national macro-moth recording scheme: there is already a national monitoring network for macro-moths, in the form of the Rothamsted Insect Survey (Woiwod & Harrington, 1994). Since

1968, standard Rothamsted-design light traps have operated at a total of over 430 sites throughout Britain, with a mean of 83 sites operating per year. National distribution data from a new national macro-moth recording scheme (NMRS) would greatly complement such population monitoring. Together the two schemes would provide reliable assessments of changing conservation status, phenology and the impact of climate change (as has been achieved for butterflies; Asher *et al.*, 2001). Recent analysis of 35-year population trends from the Rothamsted Insect Survey for 338 species of common macro-moth has shown that 54% had declined in abundance, whilst 22% had increased (the remaining 24% being stable) (Conrad *et al.*, 2004). Convincing evidence of such widespread declines provides an increased sense of urgency for national distribution recording of macro-moths, for without knowledge of their distribution any attempts to conserve rare or common moths will likely be futile.

The planning and consultation project

The increasing need for a national macro-moth recording scheme (NMRS) led to discussions over recent years between Butterfly Conservation and a number of other organisations. By May 2003, a strong partnership had been built and sufficient funding obtained in order to commence a thorough consultation, planning and development project aimed towards the implementation of a new NMRS in Britain. The core partners included the Biological Records Centre, the British Entomological and Natural History Society (BENHS), Butterfly Conservation, English Nature, Joint Nature Conservation Committee, Rothamsted Research and representatives of the volunteer moth recording community. Many other organisations expressed their support. The Heritage Lottery Fund provided much of the funding for the planning project, with additional funds donated by some of the partners as well as the Biodiversity Challenge Group and the Royal Society for the Protection of Birds (RSPB). Adrian Spalding and Mark Tunmore, working under the umbrella of Spalding Associates (Environmental) Ltd. were employed to take on the project, working with Butterfly Conservation staff and under the guidance of a project steering group.

The main aims of the planning project were to:

- consult moth recorders and the wider biological recording and nature conservation community and engage them in the development of the proposed NMRS
- gauge and build support for the proposed scheme
- assess current recording capacity and existing data sets
- develop the aims and objectives of the proposed NMRS
- identify potential sources of moth records and effective routes for data flow
- consider survey methodologies, data verification and access issues
- assess computer options, health and safety and insurance issues
- arrange and evaluate a series of moth identification and recording workshops
- develop proposals for recorder training and accreditation
- suggest ways to increase numbers of moth recorders and remove barriers to participation
- provide recommendations to form the backbone of the proposed NMRS.

The planning project took just over a year to complete and its findings were compiled into a report (Spalding & Tunmore, 2004). This paper provides the first published review of these findings.

The consultation

The success of a national macro-moth recording scheme would depend on the support of the existing moth recording community. All of the project partners felt that it was vital that individual recorders and relevant organisations were given chances to voice their opinions and be involved in planning at the earliest possible stage and before any key decisions were made. The only decision made prior to the consultation process was that the scheme would be restricted to macro-moths. Therefore, an extensive consultation with existing moth recorders, entomological societies and moth groups, as well as nature conservation and biological recording organisations, formed the central theme of the planning project. The consultation would also yield information to address the other aims of the planning project, such as assessing current recording activity.

The consultation involved three discrete phases:

1. Publicity for the planning project, which was achieved through a project leaflet and web site (www.mothrecording.org.uk), announcements in the entomological journals and presentations at public events.
2. Questionnaires to the moth recording community and to the county moth recorders. The detailed results of these two questionnaires will be covered elsewhere (Spalding *et al.*, 2005 and Tunmore *et al.*, in prep.).
3. Discussion meetings, which included three national conferences (at Perth, Swansea and Warwick), three seminars (with the British Entomological and Natural History Society, the British Trust for Ornithology and moth recorders in North Wales), several smaller meetings with moth recorders, and meetings with a wide range of nature conservation and biological recording organisations.

The consultation was extremely thorough and successful. Six thousand five hundred copies of the project leaflet and questionnaire were distributed and 1032 completed questionnaires were returned (both via the project web site and by way of the leaflet/questionnaire). In addition, 68% of county moth recorders responded to the separate, detailed questionnaire sent to them. Over 200 people attended the three national conferences, which proved both popular and very enjoyable, and 32 different organisations were consulted during the planning project, including the three statutory nature conservation agencies, local records centres and museums, research organisations and nature conservation charities.

Thanks to the high level of response to the questionnaires and the support of recorders and organisations at meetings, the consultation provided an enormous amount of detailed information to inform the planning project, along with suggestions and concerns to guide the development of the proposed NMRS, and a unique insight into the current status of moth recording in Britain.

The most important finding of the consultation was that there is widespread support for the development of a national macro-moth recording scheme. Over 97% of respondents to the main project questionnaire and 100% of the respondents to the county recorders questionnaire were broadly supportive of the concept.

The current situation in macro-moth recording: recording capacity and existing data sets

People have been collecting and writing about moths for at least 300 years, but early accounts of species distributions tended to be restricted to the London area (Young, 1997). During the Victorian era the great upsurge of interest in natural

history led to the first generalised distributions for macro-moths throughout Britain. However, no systematic national recording of macro-moths existed until 1967, when John Heath organised a recording scheme for Lepidoptera at the Biological Records Centre (BRC) by appointing recorders for each county. Standard recording cards were distributed, training arranged for recorders and a number of leaflets were published which described the key identification features of critical species. The scheme ran until John Heath's retirement in 1982, at which time there was not sufficient funding to continue it and the scheme came to an end. During the scheme over 50,000 record cards were amassed and these are still held at BRC (P. Harding pers. comm.). Distribution maps for some macro-moth species were published in *The moths and butterflies of Great Britain and Ireland* series and other provisional maps were made available to recorders. The original record cards and other paper archives held at BRC would provide a good source of historical records for macro-moths, but would require verification and computer input.

Since the end of the BRC scheme in 1982, there has been no centralised system for collecting macro-moth records (other than those of Red Data Book or Nationally Scarce moths). The main repository of moth records is the county recorder network. However, a wide range of other organisations hold moth records, including local record centres, conservation organisations (e.g the Wildlife Trusts and RSPB), local natural history societies, museums, local moth groups and Butterfly Conservation branches. A significant proportion of records reside only with the original recorder (see below).

Despite the disparate nature of macro-moth recording over recent decades, there has been a huge increase in activity. The growth of local moth groups and publication of many county lists and atlases is evidence of this increase in recording. As part of the planning and consultation project, we attempted to quantify the increase by assessing the numbers of macro-moth records held by county recorders (Spalding & Tunmore, 2004). In almost all cases, there are many more records in recent years than previously. Figure 1 shows the scale of this recent increase in moth recording in selected counties. In another example, 63% of the total moth records held by the county recorder for South Lancashire (VC 59) are for the years 2000–2003 (C. Darbyshire, pers. comm.). The picture is similar for West Lancashire (VC 60) with 61% (C. Darbyshire, pers. comm.). Although these trends are widespread across Britain (two-thirds of county recorders who returned the detailed questionnaire felt that the number of records they receive is increasing each year), they are not replicated in all counties; for example, macro-moth records for Herefordshire have shown a slight decrease after a peak in the early 1990s.

How many moth records are there?

The consultation with county moth recorders provided information to estimate the number of moth records already in the network. Thirty-two counties provided estimates of their holdings, which ranged from 3000–500,000 records (Spalding & Tunmore, 2004). In total, these 32 county recorders hold over 3 million moth records. There are 61 county recorders covering Britain, so a rough estimate of the total holding would be 6.3 million records. In addition to this are many records held by individual recorders, local records centres, the National Trust (some 30,000 moth records), RSPB and others, as well as the 50,000 record cards (containing an unknown number of records) archived at BRC. The Rothamsted Insect Survey data set consists of 10 million moth records. With the number of records increasing

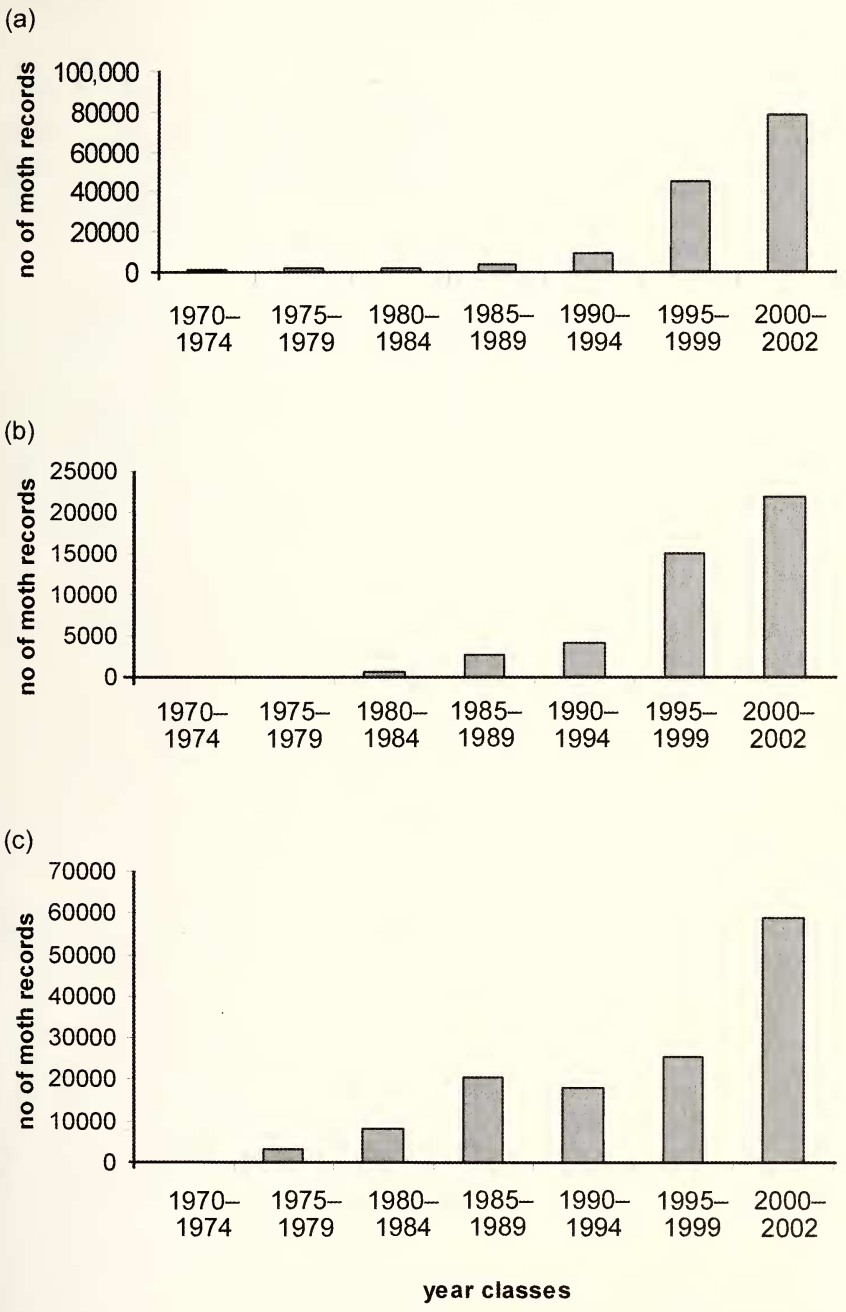

Figure 1. The numbers of macromoth records held by county recorders in selected areas of Britain, 1970–2002. (a) Suffolk, (b) Worcestershire, (c) Cheshire.

rapidly, a reasonable and conservative estimate of the total existing (but dispersed) data set would be c. 18 million records.

How many moth recorders are there?

It is difficult to estimate the total number of active moth recorders in Britain today. This difficulty stems in part from the plethora of national and local organisations whose members have an interest in moth recording, in part from the lack of a national recording scheme and in part from a feeling that the number of recorders is increasing rapidly. The best estimate to date has been 'several thousands' (Fox, 2001).

However, the consultation undertaken as part of this project yielded some real data on which to base a minimum estimate. 1032 people responded to the planning project questionnaire, all of whom were either active moth recorders (91%) or just starting to record moths (9%). In addition, the county recorders' questionnaire provided data for 39 areas and an estimate of 1086 recorders who regularly submit records (Tunmore *et al.*, in prep.). Extrapolating up to the full county recorder network gives a figure of 1700 moth recorders. However, we also discovered that 22% of recorders who completed the main project questionnaire do not send their records to county recorders, so an extra 202 moth recorders can be added to the estimate.

The project questionnaires, therefore, suggest a minimum estimate of c. 2000 active macro-moth recorders in Britain at the present time. This is likely to be an underestimate. The main project questionnaire also supports the perception that the number of moth recorders is growing rapidly. Thirty-six per cent of respondents had been recording moths for less than four years (Spalding *et al.*, 2005).

Estimating the number of active macro-moth recorders is difficult enough, but attempting to quantify the potential for new recorders is even more so. Nevertheless, we believe this potential to be large. Many organisations run moth trapping evenings and workshops aimed at beginners and these have proved very popular. Eleven such workshops were organised as part of this planning project, and were attended by 206 people. Over 50% of beginners who attended these workshops expressed an interest in taking up moth recording (Spalding & Tunmore, 2004).

Analysis of data from Butterfly Conservation's Garden Butterflies Count project, which encouraged members of the public to record 22 species of butterflies and 4 macro-moths that are commonly seen in gardens, also supports this perception. In 2002, the first year of Garden Butterflies Count, 20% of the 11,000 participants recorded at least one of the macro-moth species. This rose to an astonishing 49% of 8,200 participants in 2003 (R. Fox, unpublished data). Whilst this increase was probably largely a result of high numbers of one of the four target species during 2003, the Humming-bird Hawk-moth *Macroglossum stellatarum* (L.) (Fox, 2004), the general findings of this 'citizen science' project and the popularity of moth trapping evenings and training events for beginners, suggest that there is indeed considerable potential to recruit new macro-moth recorders in the future. Such potential would be best developed within the infrastructure, publicity and support of a new national macro-moth recording scheme.

Aims of the proposed NMRS

Distribution records of macro-moths could be used in many different ways in nature conservation, development control, policy and legislation, research into

climate change and phenology, education and raising awareness. In the consultation questionnaire, moth recorders were asked for their views on what should be the main aims of the proposed NMRS. Most respondents felt that highlighting trends in moth populations and using records to help conservation were the most important aims. Approximately 80% of respondents highlighted these two aims respectively. Sixty-six per cent of respondents also expressed the view that the proposed NMRS should work towards the production of a national atlas of macro-moths over a period of years.

Some key elements of a future NMRS

As a result of the extensive consultation, the planning project report makes 39 summary recommendations for the development of the proposed NMRS (Spalding & Tunmore, 2004). These will be reviewed by the project partners and developed into funding bids with the aim of setting up a recording scheme within the next two years. The recommendations can be viewed in full on the project web site (www.mothrecording.org.uk), but some of the key elements that will form the backbone of a future scheme are reviewed here.

As endorsed by clear majorities of recorders attending the three national conferences, the proposed NMRS should be run by a partnership of relevant organisations, led by Butterfly Conservation. This partnership would not be restricted to the organisations involved in this planning project.

The proposed NMRS should comprise a number of different activities. At its core would be a national recording scheme for all macro-moths, designed so that existing moth recorders can feed in their records easily, be aware of what will happen to their records and receive useful and interesting feedback. However, other activities would run in parallel to this core recording scheme, under the umbrella of the NMRS. These might include targeted surveys of threatened species and habitats, public participation surveys to raise awareness of moths and moth recording, and education projects with schools. In addition, the NMRS should form close links with existing recording projects such as National Moth Night (Tunmore, 2004).

The core recording scheme should be based upon the existing network of county moth recorders. Recorders would be encouraged to submit records via this network and the NMRS would provide support to county moth recorders as appropriate. However, alternative routes for data submission should also be considered to maximise participation in the scheme. Even in such cases, data should flow back to the appropriate county recorders for verification. The NMRS should seek to collate existing (recent and historical) moth records so that the changing status of macro-moth species can be assessed.

The reputation of the NMRS would depend on high standards of data quality and clear systems must be put in place to ensure adequate verification of records and validation of computerised data. Verification is a key issue for species-rich taxa such as macro-moths and presents a qualitatively different challenge compared to national recording of butterflies. Verification issues are discussed further in the following section.

The proposed NMRS must deliver practical benefits for moths (i.e. by supporting nature conservation efforts), but also for participating recorders. Feedback to recorders is an essential element of any successful recording scheme, and can be achieved through newsletters, meetings, web sites and articles in journals, as well as by working towards a national atlas. The NMRS would utilise all of these methods. However, discussions with recorders during the consultation suggested that the

NMRS could deliver great practical benefits by providing recorders with direct access to view the NMRS database (at an agreed level of geographical resolution) via the internet (e.g. via the National Biodiversity Network Gateway, www.searchnbn.net). As well as providing up-to-date feedback regarding recording coverage and poorly worked areas, such a facility could yield much of interest to recorders, for example the progress of species that are expanding their ranges, the macro-moth fauna already recorded from a particular area to help identify new 10 km or county records, by suggesting likely areas for recording scarcer species and by assisting with the determination of observed moths. An internet database might also be an efficient way to deliver the information needed by conservation agencies and partners in the Biodiversity Action Plan process.

Training of moth recorders, whether beginners or experienced recorders, should be an important part of the proposed NMRS. Training in moth identification, recording techniques, difficult groups, determining specimens, use of computer software and organising public events could all be part of the programme. Training will be a vital element in encouraging new moth recorders, particularly in areas of the country or sectors of the community in which there are currently few people interested in moths.

In addition to training programmes, elements should be developed within the proposed NMRS to specifically encourage beginners. For example, projects concentrating on easily identified and conspicuous macro-moths and/or their larvae would help overcome current barriers to involvement in moth recording created by ignorance, identification difficulties and dependence on expensive moth-trapping equipment. These projects could be supported by popular publicity, a range of visual aids such as colour identification charts, and web pages with photographs and distribution maps. As well as repeating the formulas of successful public participation projects such as Garden Butterflies Count, Big Garden Birdwatch and the Great Stag Hunt (for the Stag Beetle *Lucanus cervus* L.), the NMRS should seek to link in to other, more comprehensive initiatives aimed at increasing individual and community participation in environmental issues and decision making.

Difficult issues: verification, ownership and access

Whilst there was great support for the proposed national macro-moth recording scheme throughout the planning and consultation project, concerns were raised consistently about certain issues. Verification, ownership, and access to records all provoked strong, often contrasting, reactions and must be addressed clearly by the proposed scheme. The planning project provided a lot of information on these issues and it will take time to formulate the best approach to take in the future. Here we present some initial thoughts on these complex and heartfelt issues.

Verification of records is essential and, ideally, the appropriate county moth recorder(s) would verify all NMRS data. However, in order to make the verification process as efficient as possible, the NMRS should, where necessary, aim to support county moth recorders and others by producing and publicising lists of critical species, encouraging accurate recording and developing national or regional verification panels to share the workload and responsibility. The scheme should promote the continuing importance of specimens, where appropriate, for accurate identification and hence nature conservation and research.

Moth recorders would retain ownership of their records and their legal rights (e.g. moral rights, intellectual property rights) over the way that their records can be used.

However, for the proposed NMRS to function, recorders would have to agree that the scheme could use their records in certain ways. The NMRS would try to make this clear and simple by publicising information about how records will be stored and used by the NMRS and providing feedback to recorders, showing how records are being put to use to benefit moths.

Access to records was another issue that generated much interest during the consultation. Opinions covered a wide spectrum of views from complete openness to severe restrictions on access to records. We recommend that all data entered into the recording scheme should be as fully available as possible to all for the advancement of knowledge and understanding of our native fauna and flora and its conservation. On the other hand, if making records available increases the risk of damage to populations or their habitats, then access may need to be controlled.

Clearly, there are risks to consider and balances to be struck. Not all users require access to records at the same level of detail (e.g. the general public might only have access to data at a 10 km square level) and the sensitivity of some records is greater than others for genuine reasons (e.g. a legal requirement by a landowner not to disclose records). The precise proposals have yet to be formulated, but it is certain that the new scheme should develop a clear data access policy, so that all recorders understand who else will be permitted access to their records once in the NMRS, and under what circumstances. Records must be accessible if they are to be used in nature conservation and in informing the planning process, but recorders have the right to know how their records will be used (and by whom) before they decide to contribute to the proposed national macro-moth recording scheme.

Conclusions and next steps

This planning project for a national macro-moth recording scheme has achieved many successes, including a very thorough consultation with the existing moth recording and nature conservation communities, high levels of publicity to raise awareness of the proposed scheme, and the collation of a vast array of views and information to inform the development of the proposed NMRS. The questionnaire produced the largest and most thorough survey of Britain's moth recording community.

There has never been a more opportune time to create a recording scheme for macro-moths. Many species appear to be in decline and over 20 are considered extinct, while others are colonising our islands or expanding their former ranges (Parsons, 2003). The number of active recorders and the quantity of records being generated and computerised are unprecedented and suggest that a comprehensive assessment of species' national distribution and distribution change may be achievable for all macro-moths for the first time. Such data could be used to greatly increase awareness and conservation of macro-moths, and provide the first rigorous assessment of the changing status of a species-rich invertebrate taxon, particularly when considered alongside population monitoring trends from the small number of Rothamsted Insect Survey sites.

Thanks to your support, we have a clear view of the main elements that will make up the proposed NMRS and will now seek funding with the aim of bringing it into existence. Securing the necessary funding will not be easy or quick. Furthermore, long-term security of funding is what the proposed NMRS will need; a significant challenge in today's financial climate. Nevertheless, with your help and the planning project we have done much already to pave the way for a national macro-moth recording scheme.

Acknowledgements

We would like to thank all of the moth recorders and many organisations who participated in the planning and consultation project for all their support and input. We are grateful to Tony Prichard, Tony Simpson, Steve McWilliam and Chris Darbyshire for providing analysis of the numbers of macro-moths they hold for their counties (used in Figure 1 and text). We wish to acknowledge the financial support of the Heritage Lottery Fund, English Nature, the British Entomological and Natural History Society, the Joint Nature Conservation Committee, Biodiversity Challenge and the Royal Society for the Protection of Birds, as well as help in kind from the National Biodiversity Network Networking Naturalists Project, Scottish Natural Heritage, BRISC, Warwick University, Cellcreative and many individuals, too numerous to list here. Finally, we thank all of the members of the project steering group for their support and guidance during the planning project.

References

Asher, J., Warren, M., Fox, R., Harding, P., Jeffcoate, G. & Jeffcoate, S. 2001. *The millennium atlas of butterflies in Britain and Ireland.* Oxford University Press, Oxford.

Brereton, T. & Stewart, K. 2003. *Agri-environment schemes and butterflies newsletter July 2003.* Butterfly Conservation, Wareham.

Conrad, K. F., Woiwod, I. P., Parsons, M., Fox, R. & Warren, M. 2004. Long-term population trends in widespread British moths. *Journal of Insect Conservation* **8**: 119–136.

Department of the Environment. 1994. *Biodiversity, the UK action plan.* HMSO, London.

Fox, R. 2001. Butterflies and moths. In *The changing wildlife of Great Britain and Ireland*, (ed. D.L. Hawksworth), pp. 300–327. Taylor and Francis, London.

Fox, R. 2004. A tale of two surveys. *Butterfly* **86**: 30–31.

Glen, D. M. 2004. Birds as predators of Lepidopterous larvae. In *Insect and bird interactions*, (Eds. H.F. van Emden & M. Rothschild), pp. 89–106. Intercept Ltd., Andover.

Parsons, M. 2003. The changing moth and butterfly fauna of Britain during the twentieth century. *Entomologist's Record and Journal of Variation* **115**: 49–66.

Spalding, A. & Tunmore, M. 2004. *Planning phase of a national macro-moth recording scheme.* Unpublished report to Butterfly Conservation. Spalding Associates (Environmental) Ltd., Truro.

Spalding, A., Tunmore, M., Parsons, M. & Fox, R. 2005. The state of moth recording in Britain: the results of the national macro-moth recording scheme consultation questionnaire. *Atropos* **24**: 9–19.

Thomas, J. A., Telfer, M. G., Roy, D. B., Preston, C., Greenwood, J. J. D., Asher, J., Fox, R., Clarke, R. T. & Lawton, J. H. 2004. Comparative losses of British butterflies, birds, and plants and the global extinction crisis. *Science* **303**: 1879–1881.

Tunmore, M. 2004. National moth night 2003. *Atropos* **22**: 11–13.

Tunmore, M., Spalding, A., Parsons, M. & Fox, R. In prep. The county moth recording network in the 21st century: the results of the national macro-moth recording scheme consultation questionnaire for county recorders.

Vaughan, N. 1997. The diets of British bats (Chiroptera). *Mammal Review* **27**: 77–94.

Woiwod, I. P. & Harrington, R. 1994. Flying in the face of change: The Rothamsted Insect Survey. In *Long-term experiments in agricultural and ecological sciences*, (Eds. R. Leigh and A. Johnston), pp. 321–342. CAB International, Wallingford.

Young, M. (1997). *The natural history of moths.* Poyser Natural History, London.